

SECTION 13145
STRUCTURAL RETROFIT ROOF SUB-FRAMING SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including the Conditions of the Contract and Division 01 Specification Sections apply to this section.

1.02 SUMMARY

- A. Furnish all labor, materials, services, and equipment necessary to complete retrofit steel framing work shown on the plans and specified herein.
- B. Related work specified elsewhere:
 - 1. Division 06 Section - Rough Carpentry
 - 2. Division 07 Section - Metal Roofing Panels
 - 3. Division 07 Section - Sheet Metal Flashing and Trim

1.03 REFERENCES

- A. American Iron and Steel Construction (AISC):
 - 1. Manual of Steel Construction.
- B. American Iron and Steel Institute (AISI):
 - 1. Specification for the Design of Cold-Formed Steel Structural Members.
- C. American Society of Civil Engineers (ASCE):
 - 1. ASCE 7-05 Minimum Design Loads for Buildings and Other Structures.
- D. American Society for Testing and Materials (ASTM):
 - 1. ASTM A36 Standard Specification for Carbon Structural Steel.
 - 2. ASTM A570 Standard Specification for Steel, Sheet and Strip, Carbon, Hot-Rolled, Structural Quality.
 - 3. ASTM A611 Standard Specification for Structural Steel, Sheet, Carbon, Cold-Rolled.
 - 4. ASTM A653 Standard Specification for Steel, Sheet, Carbon, Cold-Rolled, Structural Quality.

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5. ASTM A924 Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

E. Light Gage Structural Institute (LGSI):

1. Light Gauge Structural Steel Framing System Design Handbook.

1.04 SUBMITTALS

- A. Shop Drawings: Show roof framing system with accessories in plan, sections and details. Include complete drawing/description of each framing component and fastener, including metal thickness and finishes, connection details, anchorage details, and special fabrication provisions. Indicate relationships with adjacent and interfacing work. Indicate fastener types and spacing; and provide fastener pullout values.
- B. Product Data: Include manufacturer's detailed material and system description, engineering performance data and finish specifications. Indicate fastener types and spacing; and required fastener pullout values.
- C. Design Loads: Submit copy of manufacturer's minimum design load calculations according to ASCE 7-05. All loading types shall be considered: dead, live, snow, wind, and seismic. Design load calculations shall be sealed by a registered professional engineer. In no case shall the design loads be taken to be less than those detailed in article 1.9 of this specification.
- D. System Certification: Provide statement certifying the proposed system's capacity to safely resist the calculated design loads. Statement shall be provided by a registered professional engineer and co-signed by an officer of the manufacturing company.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced metal roofing contractor (erector) to install the framing system who has a minimum of three (3) years experience specializing in the installation of retrofit roof framing systems and standing seam metal roof systems.
- B. Manufacturer's Certification: Contractor shall be certified by manufacturer specified as supplier of retrofit roof framing systems and obtain written certification from manufacturer that installer is approved for installation of specified system. Furnish a copy of this certification when requested by the Owner or Architect.

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- C. Field Supervision: Maintain a full-time supervisor/foreman who is on the job-site at all times during installation of new roof system. Foreman must have a minimum of three (3) years experience with the installation of system similar to that specified.
- D. Source Limitation: Obtain all components of roof framing system from a single manufacturer. Secondary products that are required which cannot be supplied by the specified manufacturer shall be recommended and approved in writing by primary manufacturer prior to bidding.
- E. If required, fabricator/installer shall submit work experience and evidence of adequate financial responsibility. The owner's representative reserves the right to inspect fabrication facilities in determining qualifications.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Manufacturer's responsibility:
 - 1. Protect components during fabrication and packing from mechanical abuse and corrosion.
- B. Installer's responsibility:
 - 1. Store materials off ground providing for drainage; under cover providing for air circulation; and protected from wind movement, foreign material contamination, mechanical damage, cement, lime or other corrosive substances.
 - 2. Handle materials to prevent damage. Damaged material shall be rejected and removed from the site.
 - 3. Protect materials from wind-related damages.
 - 4. Inspect materials upon delivery. Reject and remove physically damaged or marred material from project site.

1.07 JOB CONDITIONS

- A. Determine that work of other trades will not hamper or conflict with necessary fabrication and storage requirements for roof framing system.
- B. Protection:
 - 1. Provide safety plan in accordance with all federal, state, and/or local regulations.
 - 2. Do not overload roof with stored materials.

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1.08 DESIGN AND PERFORMANCE CRITERIA

A. Uniform Wind Uplift Load Capacity.

1. Installed roof framing system shall withstand negative (uplift) design wind loading pressures provided metal roofing specifications. Notched purlin type systems shall be spaced at the same spacing as the existing metal purlins (approximately sixty (60) inches on center)
2. Capacity to resist positive loads shall be determined by empirical calculations in accordance with AISI. Calculation shall be sealed by a registered professional engineer.
3. Installed roof framing system shall carry negative uniform design loads with a maximum system deflection of $L/180$ as measured at the midspan of the top member.

B. Uniform Positive Load Capacity.

1. The installed roof framing system shall be capable of resisting the following positive uniform roof loads: Roof Live Load of 20 psf.
2. Capacity to resist positive loads shall be determined by empirical calculations in accordance with AISI. Calculation shall be sealed by a registered professional engineer.
3. Installed roof framing system shall carry positive uniform design loads with a maximum system deflection of $L/180$ as measured at the midspan of the top member.

C. Concentrated Load Capacity.

1. The installed roof framing system shall be capable of resisting a 200 pound concentrated load applied to the top flange at a location mid way between fasteners.
2. Capacity to resist concentrated loads shall be determined by empirical calculations in accordance with AISI. Calculation shall be sealed by a registered professional engineer.
3. Installed roof system shall carry concentrated design loads with a maximum system deflection of $L/180$ as measured at the midspan of the top member or notched purlin. Additionally, the roof framing system shall exhibit no permanent deformation or damage upon removal of the concentrated load.

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1.09 WARRANTIES

- A. Owner shall receive one (1) warranty from manufacturer of each roof framing system covering all of the following criteria.
 - 1. Ten (10) year material coverage.
 - 2. Warranty shall commence on date of substantial completion.

- B. Owner shall receive one (1) warranty from the installer of the roof framing systems covering installation and workmanship for a period of three (3) years from date of substantial completion.

PART 2 - PRODUCTS

2.01 PRODUCTS, GENERAL

- A. Refer to Division 01 Section "Common Product Requirements."

- B. Basis of Design: Materials, manufacturer's product designations, and/or manufacturer's names specified herein shall be regarded as the minimum standard of quality required for work of this Section. Comply with all manufacturer and contractor/fabricator quality and performance criteria specified in Part 1.

- C. Substitutions: Products proposed as equal to the products specified in this Section shall be submitted in accordance with Bidding Requirements and Division 01 provisions.
 - 1. Proposals shall be accompanied by a copy of the manufacturer's standard specification section. That specification section shall be signed and sealed by a professional engineer licensed in the state in which the installation is to take place. Substitution requests containing specifications without licensed engineer certification shall be rejected for non-conformance.
 - 2. Include a list of three (3) projects of similar type and extent, located within a one hundred mile radius from the location of the project. In addition, the three projects must be at least five (5) years old and be available for inspection by the Architect, Owner or Owner's Representative.
 - 3. Equivalency of performance criteria, warranty terms, submittal procedures, and contractual terms will constitute the basis of acceptance.
 - 4. The Owner's decision regarding substitutions will be considered final. Unauthorized substitutions will be rejected.

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2.02 RETROFIT ROOF FRAMING SYSTEM

- A. General: Design is based on Roof Huggers system as approved by:

The Garland Company
3800 East 91st Street
Cleveland, Ohio 44105
Telephone: (800) 762-8225
Website: www.garlandco.com

2.03 NOTCHED PURLIN TYPE FRAMING SYSTEM

- A. Materials.

1. Notched purlin framing shall be 16 gauge minimum galvanized steel meeting all requirements of ASTM A653, Grade 33 (minimum) with a hot dipped galvanized coating per ASTM A924, class G90.

- B. Characteristics.

1. Notched purlin profile shall be a stiffened zee shape with notched bottom flange and web to match the profile of the existing metal panel. The top flange shall be one and three quarters (1 $\frac{3}{4}$) inch wide (minimum) to provide for attachment of the standing seam panel clips.
2. The web height of the notched purlin shall be as required for installation over the existing metal panels, and to accomplish the panel lap detail for replacement standing seam roof panels as detailed on drawings.

2.04 FASTENERS

- A. Light gauge metal components shall be connected to other light gauge metal components as shown on shop drawings. The typical fastener shall be #12 diameter (minimum) HWH self-drilling, self-tapping sheet metal screws, unless otherwise noted on shop drawings.
- B. Connections to structural steel members shall be made with appropriate screw or bolt type fasteners, as indicated on shop drawings. Field welding of light gauge steel framing is not allowed. Concrete and masonry anchors, if required, shall be installed in accordance with the fastener manufacturer's recommendations.

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- C. Fasteners which are concealed by the finished metal wall or roof cladding system shall be coated with the manufacturer's standard corrosion resistant finish, such as zinc plating.
- D. Fasteners which are will be exposed after installation of the finished metal wall or roof cladding system shall be series 410 stainless steel with painted heads matching the color of adjacent materials.

2.05 FABRICATION

- A. Shop fabricate metal framing components to the maximum extent possible, forming metal work with clear, sharp, straight, and uniform bends and rises.
- B. All welding, if required, shall be performed under shop conditions. Field welding is not acceptable.
- C. Fabricate framing and related sheet metal work in accord with approved shop drawings and applicable standards.

PART 3 - EXECUTION

3.01 EXECUTION, GENERAL

- A. Comply with requirements of Division 01 Section "Common Execution Requirements."

3.02 PREPARATION

- A. Inspection: Examine the alignment and placement of the building structure and substrate. Correct any objectionable warp, waves or buckles in the substrate before proceeding with installation of the metal roof framing system. The installed roof panels will follow the contour of the framing system and may appear irregular if not corrected.
- B. Establish straight side and crosswise benchmarks.
- C. Use proper size and length fastener for strength requirements.
- D. Rectangular Roofs shall be checked for square and straightness. Cable ends may not be straight; set a true line for the framing system with string line.
- E. Measure the roof lengthwise to confirm lengths, overhangs, and coverage of flashings at eaves and ridges. Coordinate framing system layout with standing seam roof panel installation details/shop drawings.

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- F. Pre-roofing conference: Prior to beginning roofing work, a pre-roofing conference shall be held to review work to be accomplished.
 - 1. Engineer's representative, owner's representative, prime contractor and all other subcontractors who have equipment penetrating roof or whose work involves access to roof, and retrofit roof framing system manufacturer's representative shall be present.

3.03 FRAMING SYSTEM INSTALLATION

- A. Notched Purlin Type Framing System.
 - 1. Install notched purlin type framing system over existing standing seam roof panels.
 - 2. Locate new framing directly above existing purlin locations, per manufacturer's recommendations.
- B. All details will be shown on manufacturer's shop drawings; install framing system in accordance with approved shop drawings and manufacturer's product data, within specified erection tolerances.
- C. Isolate dissimilar metals and masonry or concrete from metals with bituminous coating. Use gasketed fasteners where required to prevent corrosive action between fastener, substrate, and components.
- D. Limit exposed fasteners to extent indicated on shop drawings.
- E. Attach framing system to existing roof structure using fasteners of size and spacing as determined by manufacturer's design analysis to resist all specified design loads.
- F. Installed system shall be true to line and plane and free of dents, and physical defects.
- G. Maximum variation from true planes or lines shall be one quarter (1/4) inch in twenty (20) feet and three eighths (3/8) inch in forty (40) feet or more.
- H. Remove damaged work and replace with new, undamaged components.
- I. Touch up exposed fasteners using paint furnished by roofing panel manufacturer and matching exposed panel surface finish.

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- J. Remove all miscellaneous materials and debris from roof.

3.04 FINAL INSPECTION

- A. At completion of installation and associated work, meet with Contractor, Architect, installer, installer of associated work, Owner, roofing system manufacturer's representative, and other representatives directly concerned with performance of the framing system.
- B. Repair or replace deteriorated or defective work found at time above inspection as required to produce an installation which is free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Notify the Owner upon completion of corrections.
- D. Following the final inspection, provide written notice of acceptance of the installation from the roofing system manufacturer.

END OF SECTION